Not far from Guaymas is a small village, celebrated for its gardens. A few years ago this place was devastated by heavy rains; many houses were carried away, some gardens greatly injured and others entirely obliterated. Where once there were gardens is now a large area covered with rocks, gravel and sand, resembling a dry river bed. The inhabitants point out to you many localities once fertile, now barren in consequence of excessive rains. Last summer a waterspout fell in the village of Molage in Lower California. The village is built on the brow of a range of low rocky hills, in front of which runs a small stream used to water the gardens upon either side. So sudden and great was the fall of water that before the inhabitants were aware of it the flood was upon them and many houses swept away, the people having barely time to escape with their lives. After the waters had subsided, the valley which had been filled with gardens and green fields presented a rocky waste, as barren as the adjoining hills upon which no rain had this year fallen. While travelling in this part of Mexico last autumn my attention was frequently called to spots injured by the fall of waterspouts. In a country with so little land suitable for cultivation, the loss of however little is severely felt by the inhabitants.

The period which is considered the rainy season lasts from July to December. In one place the rains may commence in one month, in another place some other month, and no two places, however near, are likely to have the same amount. For example, about Guaymas last season the rainy season commenced in the middle of August and ended about the first of October, during which four good rains fell, while at Angel's Bay in Lower California, the first rains were a shower in the early part of November and another about the first of December. After this vegetation quickly sprang up and into bloom, so that at the time of my visit the place looked like spring, while at the same period the vegetation about Guaymas, only two hundred miles distant, had come to maturity.—*Dr. Edward Palmer.*

ZOOLOGY.

Kidney in Sea-Urchins.—The brothers Sarasin (*Zool. Anzeiger*, 227) claim that the brown structure which surrounds the stone canal of the sea urchins, and to which numberless functions have been ascribed, is in reality a nephridial apparatus. In Asthenosoma this organ rests below on the circumoral blood and water rings, and throughout its extent it forms a large hollow tube. From this cavity are given off numerous large glandular folds, composed of cells which resemble those of renal organs, and notably those of the

Molluscs. These glandular pouches empty into the main lumen by narrow ducts, while delicate canals, following a contorted course, extend to the periphery of the organ and terminate by ciliated funnels in the body cavity in a manner which recalls the nephrostomes of segmented animals. The excretory duct runs towards the aboral surface, and beneath the stone canal forms a narrow duct, both stone canal and ureter uniting in a common collecting vescicle which empties through the madreporic canals.

LIFE HISTORY OF HAIR-WORMS.—In a recent paper on the hair worms L. Camerano discusses several points in connection with these forms. He thinks that the same species may occur in different hosts, the filiform condition being found only in insects. Man may be occasionally a host for some of the larval stages. The cycle of the individual is as follows: The eggs, which are laid freely in the water, hatch out larvæ which swim freely and then obtain entrance to a host when they become encysted and undergo a metamorphosis. The metamorphosis results in the young, filiform larvæ which grows directly into the adult, with sexual organs developed. This lives freely in the water where copulation takes place and the eggs are laid. Some strictures upon the account given by Camerano may be found in the *Zoologisches Anzeiger* for 1888, p. 70. Villot there states that some of Camerano's species are in reality immature forms.

THE ORIGIN OF SEGMENTAL ORGANS.—M. F. E. Beddard (*Q. J. M. S.*, 1888) discusses the structure of the nephridia in Acanthodrilus and Perichæta. In each of these genera there are several segmental organs to each segment, there being in Acanthodrilus over a hundred apertures in a segment. The glandular part of the system varies much from the typical condition of nephridia in other respects. In Acanthodrilus the inner openings of the tuft-like nephridia were not found, while the excretory ducts of the eight or more organs in each segment were branched, each branch communicating with a nephridiopore. In Perichæta the case is even more complicated. The tubules were not observed to branch in the body wall, but in the body cavity the nephridial system forms a continuous network passing through the dissepiments from one segment to another, while the systems of the right and left side of the body also communicate with each other. Internal funnels were not found. Beddard reviews the opinions advanced by various naturalists as to the phylogemy of the nephridial system of the annelids and thinks that the new facts which he adduces favor the view that the annelid excretory system is directly traceable to that of the Plathelminthes. He, however, differs from Lang in his theory in that he does not regard the longitudinal duct of many annelids as in any way homologous with that of the Plathelminthes, but, in the light of Wilson's researches, as an entirely different structure.

Branchial Eyes of Branchiomma.—Branchiomma is a genus of Sabillid worms remarkable for possessing eyes on the tips of its gills. C. Brunotte (*Comptes Rendus,* 1888, p. 301) has recently described the structure of these, arriving at the following conclusions. They are to be regarded as a new type of compound eye formed of two layers, an outer dioptric and an inner sensory. The outer surface is facetted and beneath each facet is found a small spherical lens situated above a rounded cavity which is filled with a large nucleated cell, and behind this is an elongated refractive body connected with terminations of the optic nerve. This part of the eye is without pigment.

Phosphorescent Organs of Thysanopoda.—R. Vallentin and J. T. Cunningham discuss the structure and functions of the phosphorescent organs of *Thysanopoda* (*Nyctiphanes*) *norvegica* in the February number of the *Quart. Jour. Micros. Science.* These crustacea have long been known to have eye-like organs upon the sides of the body and in the median line,—organs which were universally regarded as accessory eyes until the present decade. There are ten of these organs, their distribution being pretty uniform in all the genera of the family Euphausidæ to which Thysanopoda belongs. All of these organs except those on the peduncles of the eyes have the same structure. Behind the organ is bounded by a layer of wavy laminæ forming a hemispherical unperforated cup open in front. This is compared to the reflector described by von Lendenfeld in Fishes (*vide Amer. Nat.* xxii.). This reflector is lined internally with red mesodermic pigment-cells, and their interior are lined by a layer of large columnar cells, inside of which is a curious fibrillar structure which surrounds the inner half of the biconvex lens. Outside the lens occur a circular cornea followed by the ordinary epidermis and the usual cuticle. All of the cellular layers outside of the pigment zone are ectodermal. The organ in the ocular peduncle differs in the absence of lens and cornea. Some notes occur on the development of these organs.

The observations on the function of these organs are more interesting. In life the animals are incessantly active and in the dark give out, occasionally, short flashes of light. When touched with the hand a flash immediately followed, while handling caused all the organs to shine for five or ten seconds. Continuation of the handling caused an almost unlimited succession of flashes until the animal was exhausted. The stronger the pinch, the longer and more brilliant was the light. If crushed and rubbed between the fingers certain particles were luminous and remained so until dry. Chemical stimulation with corrosive sublimate and nitric acid also produced activity of the organs. Careful microscopical study showed that in the light the inner surface of the reflector possessed fluorescent qualities, while when crushed in the dark this same layer emitted an intrinsic light. A comparative review of phosphorescent organs in other animals concludes the paper.

REPRODUCTION OF LOST PARTS IN THE LOBSTER.—Mr. George Brook (*Proc. Roy. Phys. Socy. Edinb.*, ix.) after a historical résumé of the results of others, details the results of his own observations on the reproduction of lost legs and antennæ in three lobsters which he kept in confinement. He concludes that in the lobster at least—contrary to Reaumur—the new appendage, which is formed beneath a thin pellicle soon after the loss, is only set free at the time of molting. The antennal rudiment is at first conical, then becomes coiled in a spiral, and at the first molt this is set free, but the normal size is not reached until three or four molts. The large claws also required a similar period, becoming as large as their fellow. In one instance the right claw was lost when the pincer of the left side was three inches long. At the next molt the new right pincer was $2\frac{3}{8}$ inches long, while its fellow had increased to $3\frac{3}{8}$ inches; at the second molt the difference between them was reduced to $\frac{1}{2}$ inch, while the third molt reduced the disparity to $\frac{1}{4}$ inch. The ambulatory limbs, on the contrary, regain their full size in a single molt, an observation at variance with Chantran's account of the reproduction of lost parts in Astacus.

THE OSSICULA AUDITUS OF THE BATRACHIA.—The following is an abstract of a paper read before the United States National Academy of Sciences at its meeting in Washington on April 18th, 1888. The conclusions reached are the following:

First.—The relations of the stapes to the quadrate cartilage or bone in tailed batrachians are of two types; in the one the stapes is connected with the quadrate; in the other it is not. The former arrangement is possessed by the Proteida, Trematodera, Amphiumoidea and Pseudophidia (*Cœciliidœ*); the other by the Pseudosauria (*Myctodera*) and Trachystomata. The larval structure in the Pseudosauria, and inferentially in the Trachystomata, is identical with the structure characterizing the adults of the other division. This is confirmatory of the opinion which I have expressed [1] as to the origin of the genus Siren. This is to the effect that Siren is an animal which is descended from a land salamander, and its immediate ancestor became aquatic again at a comparatively late period of geological time. My opinion was at first suggested by the condition of the branchiæ in very young animals, where they are functionally abortive, and do not become respiratory organs until later in life, the largest animals having the best developed gills. The characters of the stapes confirm this view, since they are those of land salamanders, as distinguished from those of aquatic habitat.

Secondly.—There are three types of relation between the ceratohyal arch and the skull. In the one there is no connection between the two, as in the Pseudophidia. Secondly the connection is ligamentous. This is seen in Proteida, Trachystomata, and all Pseudosauria except the Amblystomidæ and Plethodontidæ. The last two

[1] American Naturalist, 1885, p. 1226.

families embrace the third type, in which the ceratohyal is articulated by suture with the quadrate. This last type is the most specialized, since the larvæ of those families display the connection between the ceratohyal and the skull similar to that seen in the type second. Thus the Salamandridæ, which are superior to the Plethodontidæ in their osseus carpus and tarsus and opisthocœlous vertebræ, have the hyoid connected with the skull as in the larvæ of the latter.

Third.—At a stage in the history of the development of the Salientia, the relations of the stapes and of the ceratohyal to the skull are the same as in a transitional stage of the Urodele family of Plethodontidæ. Or taken separately, the relations of the stapes are those of Proteida, Trematodera, and larval Pseudosauria, while the relation of the ceratohyal is as in adult Plethodontidæ and Amblystomidæ. This is when the interstapedial cartilage connects the stapes with the posterior face of the quadrate cartilage, and when the ceratohyal articulates with the posterior face of the quadrate at its distal part.

Fourth.—It is not probable that the epistapedial forms an integral part of a primitive element representing the ossicula auditus, as it originates independently of the interstapedial and mesostapedial.

Fifth.—The interstapedial and mesostapedial do not at any time in the history of the development of the genus Rana form any part of the ceratohyal or Meckelian ventral arches. As the incus and malleus of the mammalian ossicula auditus are segmented from the proximal parts of these arches, embryology indicates that they are not homologous with the ossicula of the Salientia. From this point of view the latter form a special line of development, distinct from that displayed by the Mammalia, unless the developmental record has been greatly falsified by cænogeny. From the embryological standpoint it follows that the ossicula auditus of the Batrachia Salientia must be excluded from the discussion of the homologies of the mammalian ossicula.

Sixth.—But the characters of the Ganocephala and Rhachitomi permit the following reflections, since the latter order is the one from which the Salientia derived their descent. The existence of a well-developed columella auris which is unsegmented, in the former orders, apparently like that of the Lacertilia, suggest that the segmentation seen in the Salientia is a specialization of later origin. This columella has also the position of the proximal part of the ceratohyal in the adult frog and the larval salamander. As the position of this element in all but the youngest tadpoles is a result of cænogeny, it may be inferred that the ossicula auditus of both the Rhachitomi and the Salientia represent the separated proximal end of that arch, and hence be truly homologous with the incus of the mammal. The probability that this is the case is increased by the character of this element in the Pelycosaurian genus Clepsydrops[1] where the columella extends to the cranial wall, leaving

[1] See Proceed. Amer. Philosoph. Society, 1884, p. 41, Pl.

the stapes to one side. This is exactly comparable to the relation between the interstapedial and the stapes seen in the Salientia, except that the two elements are not actually connected as in Clepsydrops. Palæontology then modifies the evidence from embryology, and renders it highly probable that the columella auris, interstapedial and incus are homologous elements, and originated by segmentation from the proximal end of a ventral cranial arch, probably the ceratohyal.

Seventh.—It follows, from what has preceded, that the condition of the representatives of the *ossicula auditus* in the Urodela is one of degeneration.

Eighth.—It becomes probable, but not certain, from the position of the tympanic disc in the Rhachitomi at the proximal base of the quadrate bone, that the epistapedial cartilage has originated as a segmentation from the proximal extremity of the quadrate cartilage, and is therefore truly homologous with the mammalian malleus. This is, however, nothing more than a possibility.—*E. D. Cope.*

EXPLANATION OF PLATE.—AURICULAR AND SUSPENSORIAL ELEMENTS OF BATRACHIA.

Fig. 1. *Trimerorhachis insignis* Cope, from below; $\frac{3}{4}$ natural size.

Fig. 2. *Zatrachys serratus* Cope, corresponding part of the skull to Fig. 1; opposite side from above; $\frac{3}{4}$ natural size.

Fig. 3. *Cryptobranchus allegheniensis* Daud.; $\times$ 2; middle part of squamosal bone removed.

Fig. 4. *Diemyctylus viridescens* Raf.; $\times$ 8; squamosal bone removed and represented at 2 a; 2 b, end of ceratohyal, showing connection with hyoquadrate ligament.

Fig. 5. *Typhlonectes compressicauda* D. and B.; from the Belize; $\times$ 3.

Fig. 9. *Amblystoma tigrinum* Green, larva; $\times$ 4; squamosal bone removed and represented (under side) at *Sq.*

Fig. 12. *Rana virescens* Kalm, larva; $\times$ 4.

Fig. 13. *Rana catesbeiana* Shaw; larva more advanced than Fig. 12; $\times$ 3.

Fig. 14. *Plethodon glutinosus* Green; $\times$ 6; squamosal bone removed and represented at *Sq.*

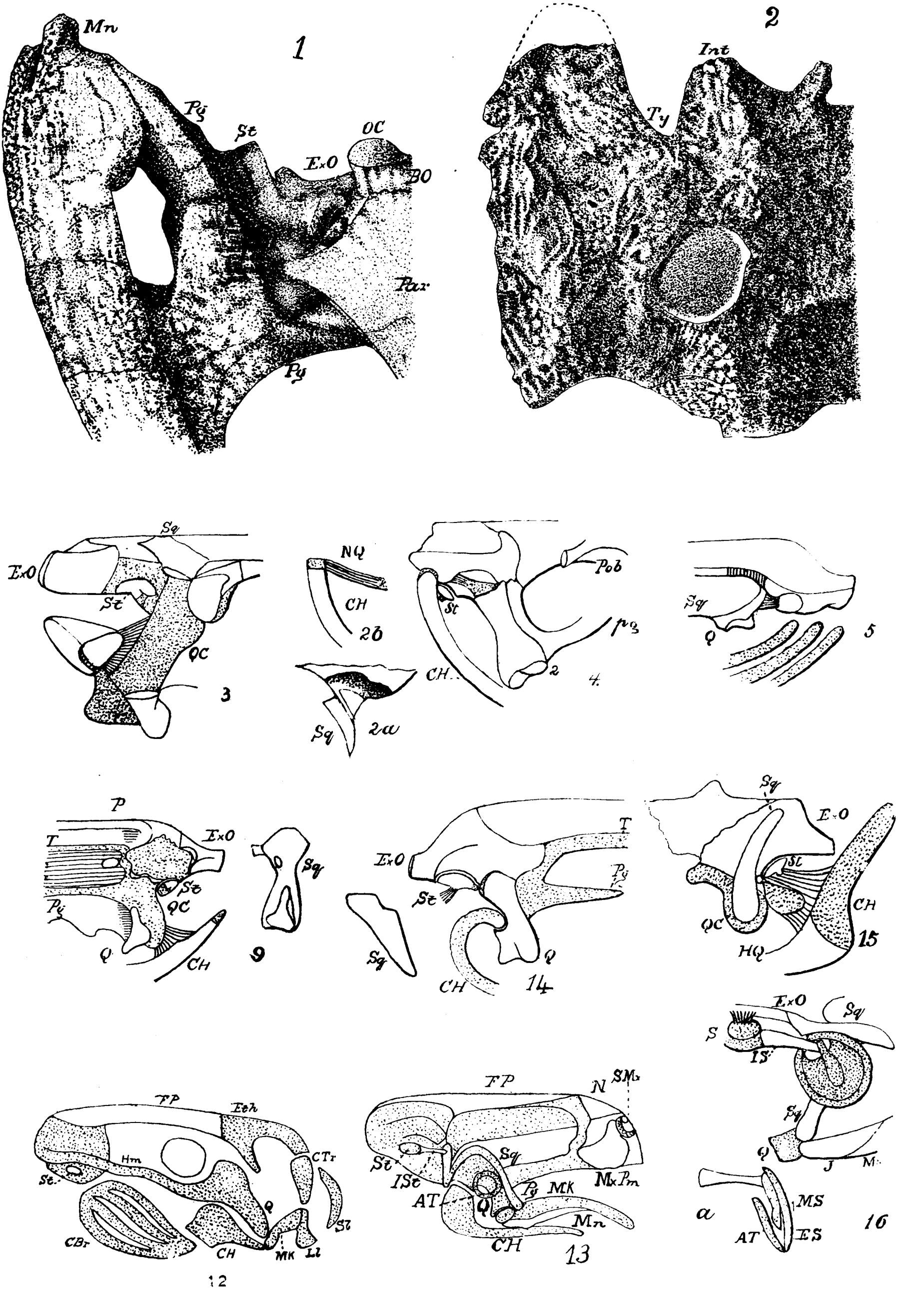
Fig. 15. *Siren lacertina* L.; $\times$ $\frac{1}{2}$.

Fig. 16. *Rana pretiosa* Bd. Gird.; $\times$ 2; auricular bones removed at *a*, the distal elements in section.

Explanation of Lettering.

A. T., Annulus tympanicus; B. O., basioccipital; C. Br., Ceratobranchial; C. H., Ceratohyal; C. Tr., Cornu trabeculi; E. S., Epistapedial; Eth., Ethmoid; Ex. O., Exoccipital; F. P., Frontoparietal; Hm., Hyomandibular; H. Q., Hyoquadrate ligament; I.

PLATE VI.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St., Interstapedial; J., Jugal; Ll., Lower labial cartilage; Mk., Meckel's cartilage; Mx., Maxillary; Mn., Mandible; M. S., Mesostapedial; O. C., Occipital condyle; P., Parietal; Par., Parasphenoid; Pg., Pterygoid; Pm., Premaxillary; Q., Quadrate; Q. C., Quadrate cartilage; S. St., Stapes; Sq., Squamosal; Sl. Superior labial cartilage; T., Trabeculum. Cartilage, dotted; ligament and membrane, lined; bone, blank.

SYSTEMATIC POSITION OF THE MONITORS.—F. E. Beddard (*Anat. Anzeiger*, 1888) points out that the Monitoridæ are in several features widely separated from the other Lacertilia, and that the same peculiarities tend to ally them to the Crocodiles. Among the points discovered by other naturalists he mentions the arrangement and development of the teeth, the complicated network formed by the hepatic and cystic ducts, and the arrangement of the blood vessels of the neck. The new features are: On cutting through the abdominal wall the viscera are not at once brought into view, as they are enveloped by a fold of the peritoneum which forms a closed sac completely separating the abdominal viscera from the heart and lungs. This feature is compared to a similar structure described by all students of crocodilian anatomy. Huxley compares this last with the oblique septum of the bird, but Beddard thinks it equivalent to the septum and to the so-called omentum as well and at the same time but an exaggeration of the structure occurring in the Monitors. If his points are well made (that the Monitors are not closely allied to the other Lacertilia but rather to the Crocodilia) Beddard thinks that the ancestry of the Crocodiles must be sought in the direction of the Monitoridæ.

A COW WITH ONE KIDNEY.—I lately saw butchered a healthy cow which had but one kidney, the right one. It was double the usual size and weight; length 11 inches, width 43 inches, weight 2¼lbs., thickness 2 inches. The ureter was present on the left side. —*Henry Shimer, M.D., Mount Carroll, Ill.*